

Flight Scientist Report  
Monday 6/07/2021 ACTIVATE RF80

Flight Type: Process Study Flight

Flight Route: KLF1 ATL1C OUTE5

Special Notes: very efficient flight in terms of # of Falcon cloud passes in under 3 hours.  
Excellent wheel-and-spoke pattern with King Air

### King Air

Pilot report (Wusk):

Second of two cooperative flights with HU-25, planned as process study in W-72. Planned route KLF1 ATL1C OUTE5, delay W-72 2+00 hours. Launched approx. 5 minutes after HU-25 on RW26, departure turnout to the north. Uneventful climb on course through ATL1C to OUTE5; leveled off at FL275 for planned VFR operations in W-72. Coordinated with giant killer (GK) for blocks 1E/2E/3E/1F/2F, and commenced turn to SE vector towards initial lat/long for briefed waypoint. Point was shifted from initial position outside eastern edge of W72 to the west in lower southeast corner of 1D. Researchers request for initially conducting a perimeter run prior to spoke run plus the late identification of the waypoint change resulted in sub-optimal positioning for the process study pattern. Subsequent turn towards expected waypoint indicated multiple potential target clouds; coordinated real-time with HU-25 to determine which cloud was the correct target and adjusted track for initial axle run to overfly cloud of interest. Subsequent perimeter/spoke runs coordinated with only minor adjustments for target cloud drift (slow drift to the NE). Throughout runs, target cloud shape and height changed substantially, at times causing uncertainty in whether we were lined up on the correct cloud. Completed one additional spoke run from NW to SE to coordinate timing with HU-25. Realtime decision made upon completion of UC-12 and HU-25 profiles to proceed different directions for return to base; UC-12 proceeded NW direct to ATL1C while HU-25 took southern vector towards the north corridor for RTB. 12x dropsondes deployed. Uneventful recovery KLF1.

Flight scientist report (Seaman):

QNC(s): Shane Seaman was the operator for HSRL-2, RSP, and the cameras.

Taylor Shingler operated the sondes.

HSRL-2: nominal operation.

RSP: nominal operation.

Cameras: nominal operation.

Sondes: A total of 14 sondes were dropped for the process study.

## Falcon

Pilot report (Baxley):

Takeoff (Z): 1730 / Land: 2030

Science flight for the HU-25 in support of ACTIVATE Campaign #4, conducted cooperatively with the UC-12 as a process flight. Route of flight KFLI-ATLIC-OUTES-3610N/07341W-KNOTS-TURET-KLFI. Departed Rwy26 with vectors to the north then east before direct to ATLIC, climbing to 5k ft MSL for initial transit, then descending to 500' MSL approximately 15 nautical miles east of KLFI. Winds were light (<15 kts) out of the west and north throughout the flight, with weather in the W-72 working area. All objectives were achieved and with no discrepancies noted.

Pilots: Thorson/Baxley

QNCs: Crosbie/Winstead

Flight scientist report (Crosbie):

Process study. We had access to the w72 warning area to conduct the process study. We found a target very early in the flight which allowed the maximum amount of time to sample the cloud. We first ramped to ~14 kft to pass over the top of the cloud system, picking the highest turret within the cluster. Initially there was a little confusion getting the UC12 coordinated. After the first pass, we commenced the standard series of legs in cloud although the first 2 legs had to be adjusted downwards because the cloud top was collapsing. Over the course of the first ~5mins of sampling, the top of the cloud appeared to collapse from around 14kft to 10kft, presumably from dry air entrainment and evaporative cooling. During the short passes that were made near the top of the cloud, there did appear to be plenty condensate but the transect was narrow – there may be some useful data just in these short passes to evaluate the immediate environment of such a situation. Lower down, it was more straightforward to execute level runs through the cloud. A second turret was identified and we adjusted the orientation of the legs to pass through both turrets. A total of 10 cloud legs were flown (12.5, 10.5, 9.5, 8.5, 7.5, 6.5, 5.5, 4, 3, 2) then an extended BCB was flown under the region of cloud sampling. Interestingly there was not a significant amount of sub-cloud precipitation (sampled and/or visible) which may indicate that the cloud system was in an early stage of maturation during the initial sampling. Upon completion of the BCB, we reposition to the SE of the cluster

to conduct the clear upward spiral from MINALT to 12kft. Near the end of the spiral, we noticed that the cloud tops were rising with us and so we ramped the last 2000 up to ~14kft while repositioning over the original target. We then commenced a spiral descent in the immediate vicinity of the original target to get some additional data in cloud and also in the immediate surroundings. It would have been better if we could have slowed this down a bit, but we were time limited. There were 10CW samples collected in this single cloud system (8 during the stacked legs and 2 during the downward spiral). (2 clear + process study)

Eddie:

Before flight, I was able to drain some butanol from the CPC 3776 reservoir & add some fresh butanol. Butanol may have gotten contaminated with condensed water

17:35:00 Takeoff

17:37:10 – 17:38:10 CPC's & SMPS on filter. All 3 CPC's and the SMPS read zero while on filter. This confirms contamination with water. CPC 3776 back working as normal, but will need entire reservoir drained and refilled.

Target cloud for process study at approx.  $36^{\circ} 12'$  lat,  $73^{\circ} 41'$  lon

18:32 Target cloud top height decreasing

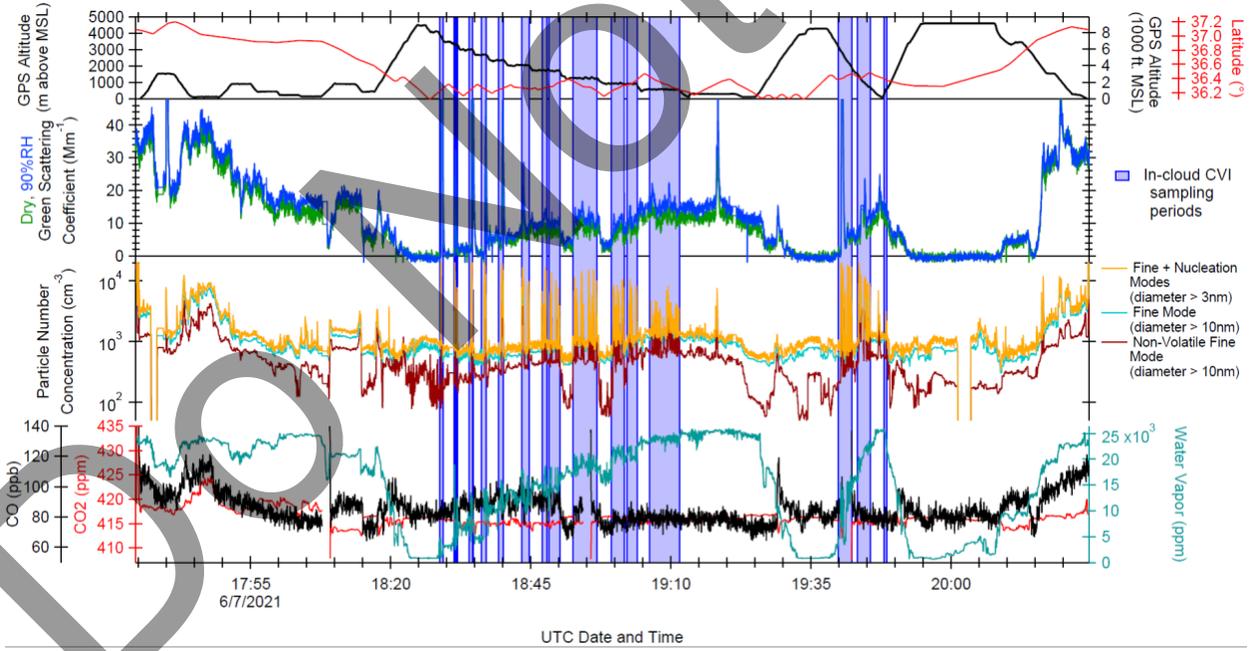
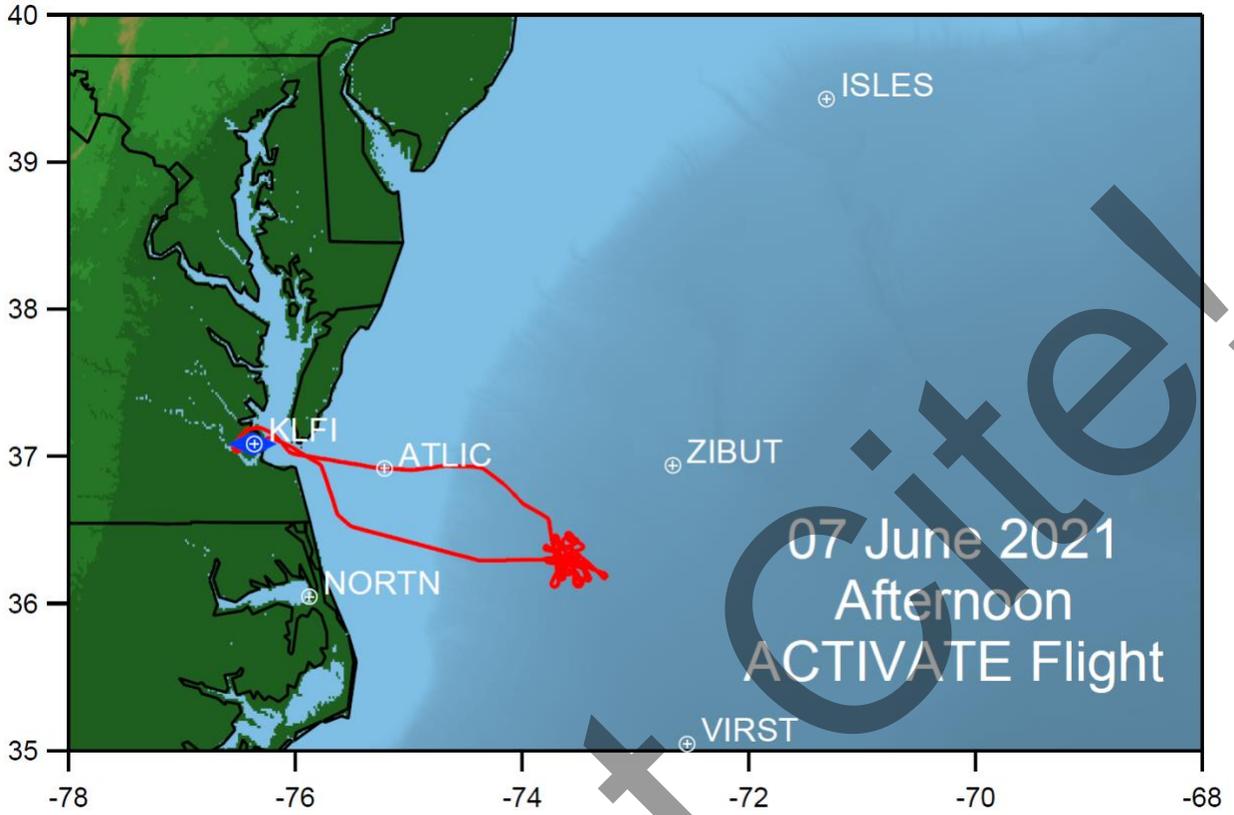
19:25:14 Start clear air spiral up

19:37:51 Start spiral down through target cloud.

20:01:14 – 20:03:30 CPC's and SMPS on filter; All went to zero

20:17 Humidifier & WCM turned off in preparation for landing

20:24:32 Landing



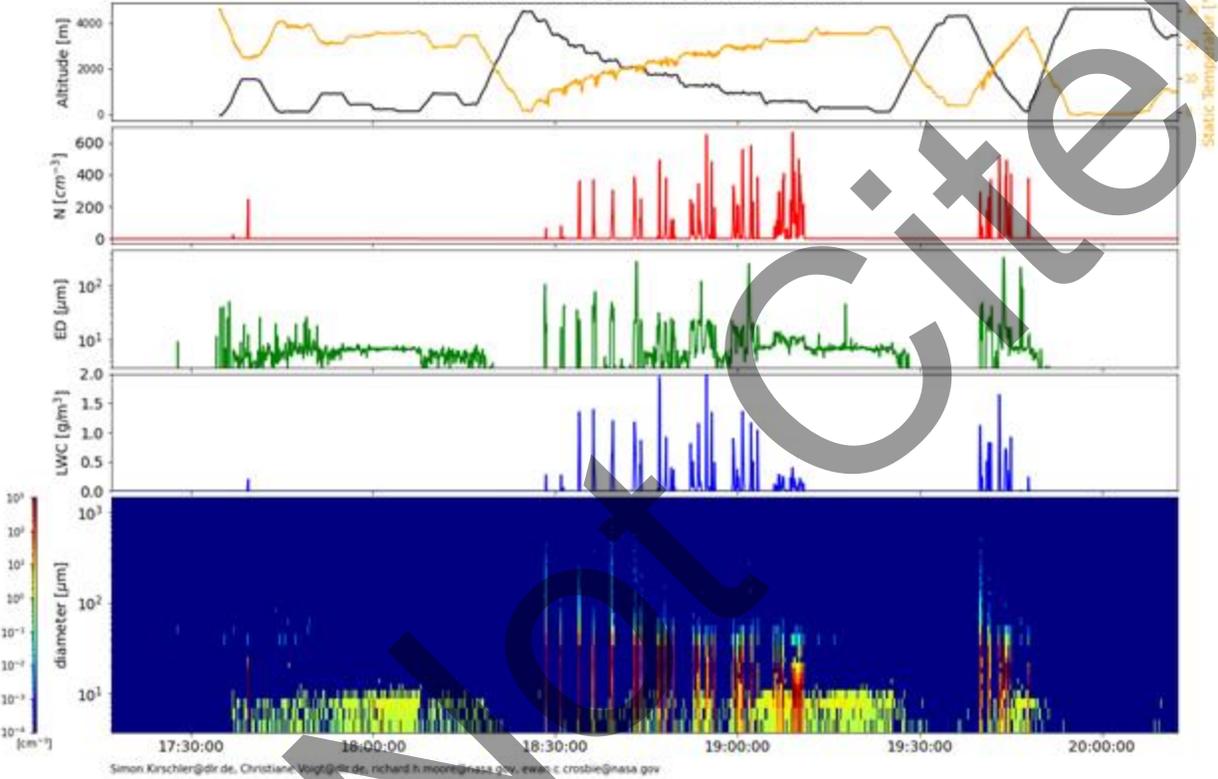
# Quicklook ACTIVATE Cloud Probes (FCDP & 2DS) Quicklook

preliminary data, only for quicklook use

Simon Kirschler, Christiane Voigt, Richard Moore, Ewan Crosbie

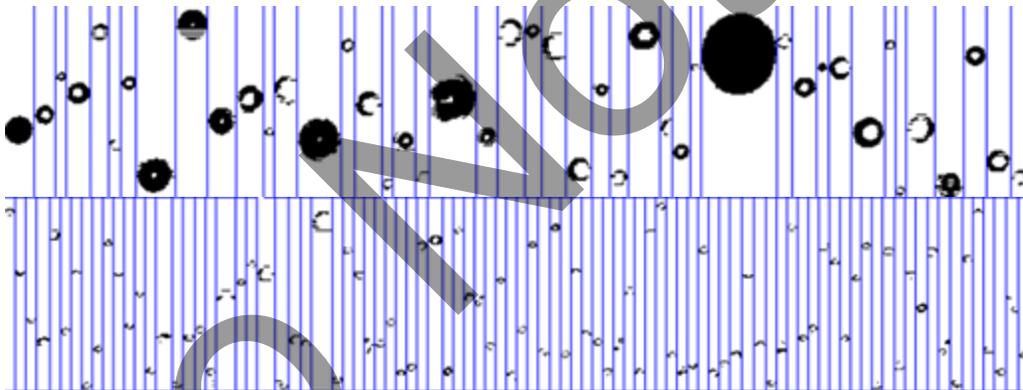
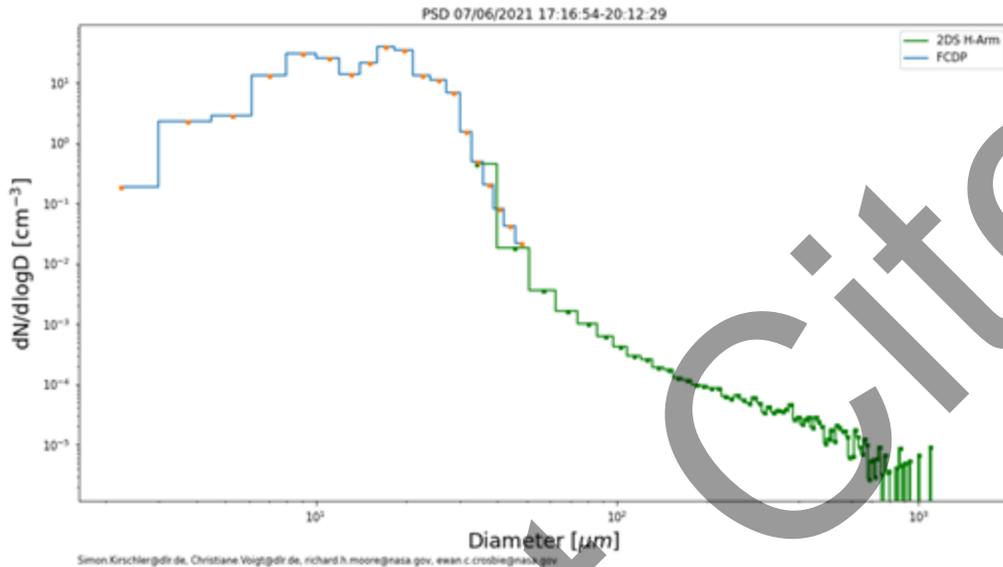


Cloud Probes (FCDP & 2DS) Quicklook 07/06/2021 17:16:54-20:12:29



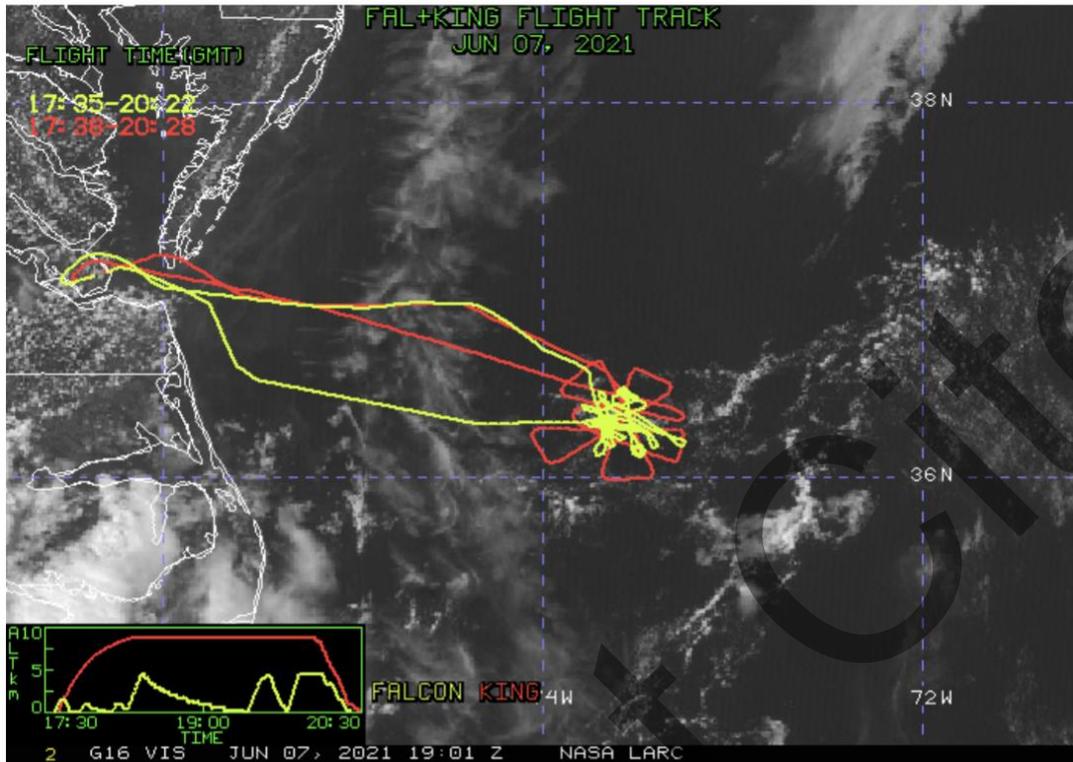
# PSD ACTIVATE

preliminary data, only for quicklook use  
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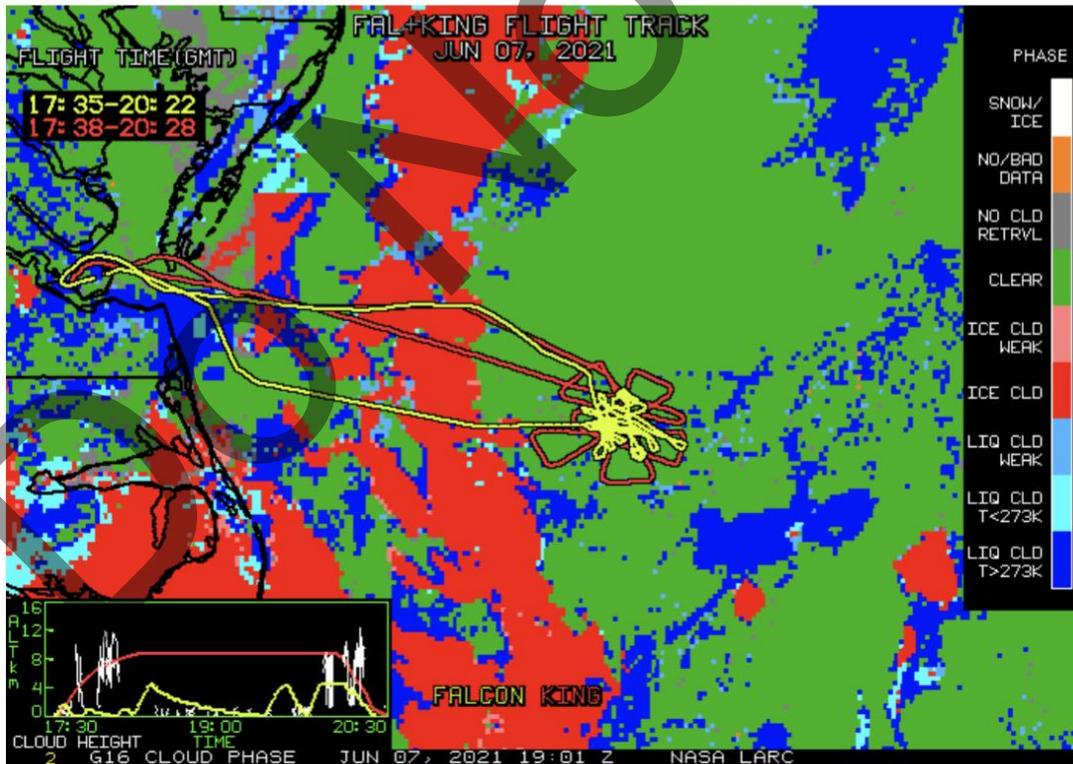


Only pure liquid clouds with drizzle and some precipitation, especially inside wall pattern.

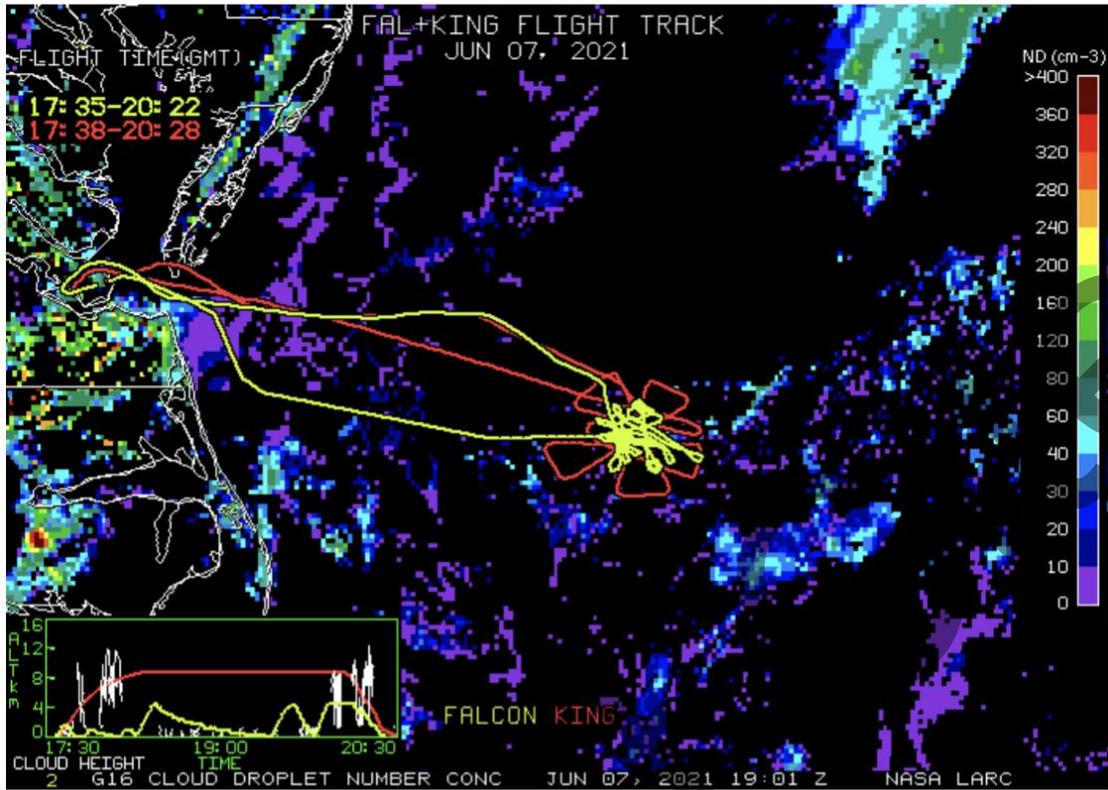
NASA-LaRC Clouds Group GOES-16 Quicklook Images for Flight 80, 19:01 UTC Jun 07, 2021  
Visible Image



Cloud Phase



### Cloud Droplet Number Concentration (cm-3)



### Cloud-Top Height (Kft-ASL)

